Journal of the American Foundrymen's Association.

VOL. XI. APRIL, 1903. PART II.

THE METALLURGICAL SECTION OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION.

BY HERBERT E. FIELD, ANSONIA, CONN.

The various committees of the American Foundrymen's Association have heretofore taken care of the problems which have arisen in connection with the advent of metallurgy into foundry practice. Owing to the increasing demand thus placed upon the Association a separate section has been organized to take care of this branch of foundry progress. This Section is designed to act as a central exchange for ideas and to direct the advancement of metallurgy in its relation to foundry and furnace practice. Foundry chemistry and foundry metallurgy have, like all new movements, been hampered by insufficient knowledge and by misleading statements made by inexperienced writers. These writers have been without doubt sincere in their opinions, but they have, nevertheless, done immeasureable harm to the advancement of chemistry in foundry practice. They wrote at a time when little was known about the subject and whatever was said was accepted as truth and practiced as such. When the expected results were not achieved, Metallurgy was condemned while in reality it was the lack of correct knowledge for its application which was at fault.

Individual chemists have from time to time brought before foundrymen the results of experiments which have proved of great value. These results have, however, lacked the backing, which a strong Association would have given them, and often passed unnoticed, or, if noticed at all, have been classed with the mass of unreliable matter previously mentioned. This Section intends to systematically investigate debated problems and to place before the members for their use the results of these investigations in such a

manner as to warrant their acceptance or rejection as correct bases for practical work. There are new propositions continually coming up in this branch of practice which are now slowly and tediously worked out by individual metallurgists in the spare time which they have at their command. The Metallurgical Section by distributing such work and placing parts of it where it can be most conveniently carried out will be able to greatly expediate these investigations. These problems will be brought before scientific institutions whose equipment and experience in original research will enable them to make a thorough and correct solution of that side of the question. The practical work in connection with the investigations will be done by founders whose equipment is best suited to the matter unconsideration. The practical and scientific will thus be combined in a manner which has been much talked of but never accomplished.

Our technical schools are more than anxious to do their part, while foundries are expressing an increasing interest in the work. A strong organization to direct is necessary to complete the success.

Numerous problems arise in regard to iron which cannot be solved by the foundryman. They can only be worked out at the pig iron furnaces. The furnacemen, by their endeavors to find out just what compositions and characteristics are wanted by the foundryman, show that they are alive to the fact that there is much room for study and improvement in their line. The first suggestion for the formation of such a Section came from the selling end of the pig iron trade, and this Section expects to count pig iron furnaces among its strongest members.

Chemistry is to have a more useful position in furnace and foundry practice. This is plainly shown by the statement of prominent pig iron and foundry men in the recent issues of trade papers. Agitation in regard to grading, sampling and standardizing indicates the great interest now manifest in this line of work. Progress has been, and will continue to be made, whether such an association is formed to aid it or not. If, however, the labor lost by duplication can be avoided and investigations carried on under the most auspicious circumstances, much greater progress will be made and advancement will be more rapid.

The first problem brought before the Section for solution is that of standardizing methods for the analysis of iron. The increasing complaint of furnacemen and founder that the analysis of

different chemists did not agree, induced the American Foundrymen's Association to refer the matter to its standardizing committee with the idea that this committee could adopt a series of standard methods for iron analyses, and thus obviate the error due to the difference in the methods used. This work has since been referred to the Metallurgical Section, and the classifying and editing of the various methods now in use is being done by its Secretary. The methods sent to the standardizing committee prove that there are many now in use in chemical laboratories which are inaccurate and unreliable. Whether this Association adopts a set of standard methods or not, it will point out as inaccurate, many methods now in use in iron work.

Many founders are having their analyses made by independent laboratories, and at the suggestion of these founders it was decided to include these laborataries in the list of those who are available for membership in this Section. They have shown a decided interest in the work and will make a valuable addition to the Association, and the Metallurgical Section will be of great practical value to them.

This Section, then, is organized for any who are engaged in the study or practice of chemistry and metallurgy of iron. There is no intention of taking the place of or interfering with the work of any other society. This is a time of specialists. We are, it is true, interested in the work of our fellow scientists in all other lines of work and would be the last to lessen in any way the great good being accomplished by our national scientific societies. There is, however, a crying need in the iron business for an association active, alive, and awake to the conditions and opportunities of the times. An association before which papers may be read? Yes! But an association which will help and educate its members in the metallurgical side of the iron business, an association which, proceeding in a thorough and systematic manner, will investigate and solve problems arising in everyday practice of metallurgy in foundry and furnace work. It is just this place that the Metallurgical Section is designed to fill, and will fill with credit to itself and to the American Foundrymen's Association, provided it is given the proper support.

The section is organized with all the prestige and support of the American Foundrymen's Association behind it. The Journal, in which all the papers and investigations of the Section, will be published, has made for itself an enviable position in the scientific

and industrial world. The American Foundrymen's Association stands as a representative of true American progress in foundry matters and its reputation is assured abroad as well as at home. The Metallurgical Section has the opportunity to share in this well earned reputation.

The essential factors for a successful organization are all present. . An opportune time, an unoccupied field, an increasing demand, and a strong parent organization. The scope and usefulness of the Metallurgical Section of the American Foundrymen's Association will only be limited by the number and activity of its members.

Those who are engaged in the practice or study of any branch of the iron trade, in which metallurgy and chemistry form an important part, will be greatly benefitted by affiliating themselves with this Section of the American Foundrymen's Association.

Journal of the American Foundrymen's Association.

VOL. XI. APRIL, 1903. PART II.

PROCEEDINGS OF THE AMERICAN SOCIETY FOR TESTING MATERIALS.

A stately volume of some 400 pages lies before us, giving the proceedings of the fifth annual meeting held in Atlantic City, June 12, 13, 14, 1902. It is edited by the Secretary, Prof. Edgar Marburg, of the University of Pennsylvania, and reflects great credit upon him as well as upon the Association. If there is any truth in the saying that an association is what its secretary makes it, we have here an excellent example of the power for good in our country's commercial interests which is exerted by an association of specialists, in fact world renowned men in their lines, who in working on standard methods for the common good, have their course shaped, their energies directed, and their results systematised by an exceptionally able Secretary and executive officer.

Our Association is an active member in this work also, and a number of our specialists on cast iron are committee members at work on the standardization of matters pertaining to our industry.

Glancing over the record presented we find the subject of cast iron covering 98 pages, or one quarter of the whole volume, which would certainly be indicative of the great interest being taken in our industry at the present time. The Atlantic City meeting has already been reviewed at length in our Journal, and therefore attention need only be called to a splendid paper on the constitution of cast iron by Prof. Howe, now first published, and which your Secretary will review shortly for our Journal.

Your Secretary can further state that the American Association for testing Materials is just organizing a committee to prepare specifications for testing cast iron and finished castings, of which committee your Secretary has been designated secretary, and over a dozen members are active participants. In the annual report for

the year more will be told of the work as outlined, it being sufficient to say here that a great mass of correspondence comes from Europe as well as from all parts of our country bearing upon the work, all of which indicates the great necessity for improvement in our product, as well as standardization wherever possible.

PROCEEDINGS OF THE PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

The Iron Trade Review, Dec. 11, 1902. The 123rd meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club in Philadelphia, on Wednesday, Dec. 3, the newly elected president, Thomas Devlin, occupying the chair.

The treasurer reported a balance in the treasury of $1,994.24, and all bills paid.

A letter was read from J. W. Moyer & Co., announcing their acceptance of the secretary's proposition that they prepare a paper to be read at the next meeting on the subject of "Tramways in Foundries."

The Sheeler-Hemsher Co , of Philadelphia, brass founders, was nominated for membership in the association and duly elected.

An address was made by Armor Ward, president of the American Brazing Co., Philadelphia, his topic being, "Saving the Scrap Pile."

Mr. Outerbridge then, by request of President Devlin, read an address which he had delivered recently to the students of the Wharton School of Finance of the University of Pennsylvania, on "The Premium System of Payment." The address, which was quite long, is to appear in the University Journal in January. Mr. Outerbridge explained that the pupils of the Wharton School visit industrial plants in a body, not so much to study the mechanical features so much as the managerial.

After the reading of the address, Dr. Moldenke, the secretary of the American Foundrymen's Association, addressed the meeting on the subject of affiliation with that organization. He referred to the good work done by the American Foundrymen's Association, and the standards it has promulgated, and urged that by the affilia-

tion of the Philadelphia body the means would be provided for an extension of the work now being done, both in research and standardization. No action was taken in the matter, but it was arranged to bring the subject before the association at its January meeting.

The meeting then adjourned to the club café where a lunch was served and an hour or two pleasantly spent.

The Iron Age, Jan. 15, 1903. The one hundred and twenty-fourth meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club, 1409 Walnut street, in that city, Wednesday evening, January 7. Thomas Devlin, the president, occupied the chair. There was quite a representative attendance.

The reading of the minutes of the previous meeting was dispensed with. The treasurer reported a balance amounting to $1664.42 on hand, with all indebtedness paid.

An application for membership from Van Fleet & Fries, foundry supplies, facing and equipment, 727 Walnut street, Philadelphia, was received, and after favorable action in committee, they were balloted for and elected to membership.

The secretary announced the death of one of the members of the association, George W. Van Tyne, late superintendent of the Singer Sewing Machine Company, Elizabeth, N. J., which occurred on December 11, 1902. On motion of Mr. Rankin the chair appointed a committee to prepare suitable resolutions and to report at the next meeting of the association.

The advisability of the Philadelphia Foundrymen's Association joining the American Foundrymen's Association as a body, or as individuals, was announced as open for discussion. James S. Stirling, Thos. I. Rankin, R. C. Oliphant, H. O. Evans, Geo. C. Davis, W. A. Bole and Howard Evans spoke on the subject, the consensus of opinion being that as many members of the Philadelphia Association are already members of the American Association, and as some members are probably not directly interested, it would be better not to enter the latter association in a body. Howard Evans announced that if a suitable contribution was made to the American Association that body would for the current year send to each member of the Philadelphia Association copies of their *Journal* as published, after receiving which the individual members

would be in a position to know just what the efforts and results of the association are and be able to measure its benefits in their individual cases. A motion was then passed that the sum of $100 be contributed to the American Foundrymen's Association, in view of a return to be made in the distribution of their *Journal* to the Philadelphia Association members.

The paper of the evening was by A. W. Moyer, of J. W. Moyer & Co., Philadelphia, Pa., the subject being "Overhead Trolley Systems for Handling Ladles, Metals and Other Materials." It was illustrated by a number of lantern slides. Discussion followed as to the best height from the ground of a tram rail system in general foundry use. Mr Moyer explained that this is governed by individual cases, instances being cited where the tram rail was placed only 5 feet from the ground. The best results are obtained when the height is such as to enable free passage over the tops of molds or such other materials as might be on the floors. After voting thanks to Mr. Moyer for his able paper, the meeting adjourned. The usual lunch was served.

The Iron Trade Review, Feb. 12. The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, in Philadelphia, on Wednesday, Feb. 4, the president, Thomas Devlin, occupying the chair

A memorial to the death of Geo. W. Van Tine, late of the Singer Mfg. Co., Elizabeth, N. J., was presented by a committee, and on motion was adopted and ordered to be spread upon the minutes.

Frank Samuel, iron merchant, Philadelphia, and James S. Stirling, vice commissioner of the National Foundrymen's Association, were elected to membership in the association.

The paper of the evening was by T. J. Fernley, secretary of the Hardware Merchants' and Manufacturers' Association of Philadelphia, and the National Hardware Association. His subject was "Cash Discounts—Their Use and Abuse." The paper dealt with the subject from the standpoint of manufacturer, jobber and retailer, and was very largely based on experiences noted in the hardware field. The author's principal point was that a cash discount should be taken as a premium for prompt payment, and in settling the cost of manufactured products should be classified as a prime

cost equally with raw materials, labor and other expenses. In other words, the discount should be added to the cost or selling price of the goods to furnish a premium for prompt payment under terms of sale in such a way that if not taken advantage of it would stand as a profit. Not only was a cash discount a good thing to stimulate collections, but its acceptance or rejection was an indication of the financial standing of the customer.

Quite a little discussion followed in which a majority of those taking part expressed the opinion that cash discounts in the foundry trade should be discouraged, as there was little chance of establishing any system which could approach the uniformity possible in the hardward trade. While it was suggested that it might be a good matter for the association to take up, the point brought out by those taking part in the discussion presented so many difficulties in the way of united action that the step could not be considered. The paper was exceedingly interesting and was much appreciated by all present.

A discussion on "The Use of Foreign Irons in Foundry Mixtures, in Comparison with Domestic Irons," then engaged the attention of the members.

D. G. Moore—We have not used any foreign irons of late, but I have used plenty at other times. I was offered some a day or two since at $20 put in our yard—pretty cheap iron, if it was any good. It was claimed to be equal to No. 1 American iron, and sold on guaranteed analysis. We had a good stock of iron so the iron did not interest me. We once used Middleboro iron a good deal but did not like it. Some of our neighbors have been using German irons this winter and say they are all right.

Mr. Matthews—We make all our mixtures by analysis, and we have run since early last spring on foreign irons entirely, and with satisfaction. There is one thing to be borne in mind about English iron, that is Middleboro. It is very soft and produces trouble on account of shrinkage. When properly mixed, however, there is no trouble with it. Iron can be obtained from the other side, and we have it, which will make any mixture you want. When working by analysis you are perfectly safe—the defects are all brought out and corrected. Sometimes the foreign irons are misjudged. I recently had a case brought to my notice where a foundry claimed to have produced castings from an English iron and they proved ut-

terly worthless. It was afterward found that none of the iron had been used in the mixture; they had used very heavy scrap. Plenty of iron can be obtained from the other side, and it is satisfactory for all kinds of work.

Mr. Devlin—From your experience, Mr. Matthews, with imported irons, and American irons, which gave you the least trouble and which the best results?

Mr. Matthews—Take the English Middleboro iron, the phosphorus must be looked after. But you can get an iron lower in phosphorus which will make a good mix; for instance, a German iron. A mixture of these irons will give you the same result as American mixtures.

Mr. Devlin—Then you would have to look to England, Scotland and Germany to get the mixtures you want?

Mr. Matthews—Yes. You can get a good Scotch iron which will give you pretty well what you want—that is, if you buy it and use it on analysis.

D. G. Moore—People I have talked to say that the German irons come nearer to being like our own than any foreign irons.

Mr. J. Thompson—We used some foreign iron last fall but did not like it. The first day's heat was disastrous. We have since used other foreign irons with good results. I believe satisfactory mixtures may be made.

Mr. Ridgeway—We tried a little Middleboro iron and had no trouble. We used it sparingly, possibly 25 per cent. We made cylinders, water wheel cases, and other things under conditions where a high shrinkage would be disastrous, and there was no trouble found. We could scrap it rather more heavily than we expected to do. We also used Scotch irons, when we were unable to get our regular softeners, and they worked very nicely. I would have no hesitancy at all to buy foreign iron today if any one has any to figure down on.

Mr. Hitzeroth—We tried a mixture of Scotch and Pennsylvania irons for two weeks, and got very good results.

Mr. Devlin—I think Mr. Matthews stated the case very clearly, and it is a good thing to know that good results can be obtained by intelligent mixing. If a foundryman knows what he wants, anal-

ises his irons, and makes a mixture to suit his requirements, he will get what he wants.

Geo. C. Davis—I have had a number of irons from foreign countries under examination, and I think the reason the German irons have succeeded so well is because they have been pretty nearly what gray irons should be. As to the English and Scotch irons, there has been a great deal of variation found in them. Generally speaking the phosphorus and manganese has been excessive. In Eastern Pennsylvania and New Jersey we have a number of irons which run low in manganese and phosphorus, and with these, and English irons high in phosphorus, provided you know what you are doing, it is possible to make a mixture to get good results. If you use English irons indiscriminately you are bound to get into trouble.

The Iron Trade Review, March 12. The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, in Philadelphia, on Wednesday evening, March 4, Dr. E. E. Brown occupying the chair in the absence of the president, Thomas Devlin.

A discussion on the topic, "Coal, Coke, Iron—Is it wise to make contracts for future deliveries at present prices?" came under the head of new business. In opening the discussion, Secretary Evans said many foundrymen were asking for information on the possibilities regarding lower prices of these commodities. Present prices for Connellsville coke, he said, seemed to be $6.75 at the ovens, and it is hard to get at that. Whether it would be advisable to place contracts at that price for delivery until July, or whether it would be best to purchase in small quantities as required, was a question of interest to all in the trade.

Stanley G. Flagg—I see that bituminous coal has gone down from $2.50 to $2, and I think now, $1.95. That has possibly some bearing on the question.

J. Thompson—We use coke in a somewhat limited way, but I do not think it policy to buy anything at the present time for more than immediate needs.

W. J. W. Moore—I do not think we are going to have any cheap fuel very soon. In order to get prompt deliveries and a careful selection of coke it would be wise to make contracts now.

Judging from the condition of the railroads the market is not likely to be well supplied with coke. It took recently four days for a car of coke to go from one point in Philadelphia to another.

W. Hanson—We are like nearly everybody else—hesitating about buying.

Dr. Brown—We use about 45 tons of coke a week, and we have found it to our advantage to contract for a year. We are paying $5 a ton at the ovens. We felt that it was a safe thing to do. It is 72-hour coke we use.

H. O. Evans—There has been a lot of very poor stock coming into the market for some time, but I notice it is getting a little better now.

W. J. W. Moore—As far as iron is concerned the prices of standard brands are maintained. The furnaces are behind in their deliveries, even though trying to do all they can. They are getting down to the question of fuel, and I do not see much relief likely to come. As the season advances, a lot of cars will be taken for grain shipment and further trouble will ensue. Deliveries at the present time are freer than they have been. Furnaces are pretty well sold up until July, so there is not much liklihood of price cutting. Recently some large sales have been made to big interests—people who would not come into the market if they thought there was a possibility of a drop in prices. It is only a question of time when all the good brands of iron will be absorbed.

Mr. Haldeman—I think it is advisable for anyone who has sold his product to cover for his requirements in all these commodities. It is not so much a question of price as the ability to get the material. Until the railroads are in such a positiion that they can transport material there is going to be an abnormal scarcity. Today we are sold ahead six months. You will find you will have to pay today's prices for six months. There is a little weakness, it is true, in coal, but it is accounted for. A great many people are shipping coal to get the high prices. It would not be fair to count on today's prices. On April 1st new prices will be fixed and there will be an agreement in all the regions, when you will find there will not be any cutting as before, as the new influences will correct that and see that no more shipments are made than can be used. As far as iron goes, people have been thinking that because of high prices there is bound to be a drop; but it is already found that only about 20

per cent. of the iron required for use has been purchased. Large buyers now are covering and those who do not cover may have to pay higher prices. The trouble is that railroads cannot haul the freight, and while this condition exists there may be a difficulty for consumers to get their wants.

A paper was next read by Dr. Moldenke, secretary of the American Foundrymen's Association, on "The Future of the Foundry Industry."

Stanley G. Flagg—I was surprised at what the Doctor said about the eight-hour day and the idea of working in three shifts. We have had some experience in that direction, although I have heard people say it could not be done. I do not think he exaggerates at all when he says it is not only possible but desirable. I believe the gradual increase of our plants and investments may bring serious conditions when we cannot get business. I have felt that when an increased output is desired it should come through different management, different methods in handling iron and so forth, all tending to double up with little more than an increase in the payroll. If in time business did not warrant a continuance the payroll could then be cut down. Our work being mostly small, the question of two men working on one job never comes up; but I should say that as two men work on one job in the same turn there appears to be no reason why they should not do the same on two turns. We have thought that we made more scrap at night than on day work, but that was due to the fact that the night shift was generally longer than the day shift, and we did not have the same illumination. I feel sure that a plant properly laid out could be run along the lines suggested in the paper.

H. O. Evans—I agree with the Doctor in what he says as to the possibility of a three-turn day. I have kept track somewhat of the theory of a continuous running of a foundry and see no reason why foundries could not adopt it.

Dr. Moldenke—In speaking of the three-shift arrangement I have in mind that the claim for the eight-hour day is that a man wants some time with his family. The second shift could stop at 12 o'clock midnight, and the other come on at 7 o'clock. If these shifts were changed over every two or three weeks a man could get some leisure during daylight. Under arrangements of

this kind when hard times come their plants will not have increased in size.

Dr. Brown—I would like to ask Dr. Moldenke what he means by Russia being our chief competitor?

Dr. Moldenke—I say our greatest future competitor will be Russia. It is a matter of race. I have been in contact with a good many Russians and the impression I have formed is that they are a peculiar people. They will spend any amount of money to see results come 300 years from now. They have sent their engineers everywhere to find out what is going on. In their industrial conditions they get all they can from the foreigners and then drive them out. The only way Russia can get money is to establish industries, and she is doing everything possible to encourage them. In Germany the unions are getting so powerful that conditions there will soon be the same as in England now.

PROCEEDINGS OF THE PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The Iron Trade Review, Dec. 4, 1902. The regular monthly meeting of the Pittsburg Foundrymen's Association was held on Monday evening, Dec. 1., at the rooms of the Engineers' Society of Western Pennsylvania.

Mr. E. D. Frohman, of the S. Obermayer Co., read a paper on the manufacture of Sea Coal facing, after which Mr. T. E. Malone, of the J. S. McCormick Co., read a paper on "Foundry Facings."

The two papers were discussed at length, S. D. Sleeth, E. A. Kebler, H M. Wilson, B. D. Fuller, S. H. Stupakoff, G. D. Springer and E. G. Seaman taking part in the discussion. It was stated that ground glass has been used successfully in the place of facings and prevents scabbing. A number of foundrymen stated that they would use this glass in an experimental way during the next few weeks, and reports of the results will be made at the January meeting.

Papers on "Malleable Cast Iron" by H. E. Diller, of Chicago, and the "Melting Ratio" by A. M. Loudon, of New York, were also read, but were not discussed at length. At the January meet-

ing of the association the topic for discussion will be "Fan Blowers." Lunch was served after the meeting adjourned.

January 8, 1903. At the meeting of the Pittsburg Foundrymen's Association, held at Pittsburg, Pa., Monday evening, January 5, the topic under discussion was "Fan Blowers," and an able paper on the subject was presented by R. B. Hayward, Pittsburg, representative of the B. F. Sturtevant Co. There was no discussion as to the relative value of the positive pressure and fan types, and it was decided to have the former discussed at some future meeting. Regarding the use of the fan blower some of the foundrymen stated that they had achieved excellent results from the use of fans, some of them doing excellent service for a period of 25 years. The installation of fans having sufficient volume, according to the statements of some of the foundrymen present, was particularly desirable, one stating that by the installation of a larger fan at his plant the fan could be operated at less speed, requiring less power, and the melt was materially increased. As to the operation of the fan toward the end of a heat, one of the foundrymen stated that he usually increased the pressure owing to clogging up of the tuyers.

Feb. 5, 1903. The regular monthly meeting of the Pittsburg Foundrymen's Association was held at Pittsburg on Monday evening, February 2. An able paper entitled "Gates and Sprues," was presented by B. D. Fuller, of the Westinghouse Electric & Mfg. Co. It resulted in considerable discussion and some interesting points were made relative to the casting of sand and chill rolls. It was stated that an 18 or 20-ton roll is poured in a trifle less than a minute, the fast pouring of the metal causing it to swirl inside of the mold, thereby carrying all the dirt and slag which pass the gates to the top. It was further stated that some twenty years ago an enterprising Pittsburg roll founder secured a patent on the method of swirling the iron inside of the mold, and that another roll maker in the district, in order to avoid an infringement of the patent, had a man stand over the mold while the iron was being poured, with a long pole, which was whirled around in the metal for the purpose of producing a swirling motion. Still another foundryman stated that he remembers the time that in casting rolls one man was engaged in churning the iron in the mold with a green pole causing

it to boil violently and thus bringing the dirt and impurities to the top. It was also stated that in casting car wheels very little time must be lost in getting the metal into the mold. In casting a 700-pound wheel requiring about 900 pounds of metal about 10 seconds is consumed in getting the metal into the mold. This fast pouring in this case has the tendency to carry the dirt to the top and out of the mold.

March 5. The regular monthly meeting of the Pittsburg Foundrymen's Association was held at the rooms of the Engineers' Society of Western Pennsylvania, Pittsburg, Pa., on Monday evening, March 2. George C. Hicks, chief engineer of the P. H. & F. M. Roots Co., of Connersville, Ind., presented a paper on "Rotary Blowers," while the overhead tramrail system of J. W. Moyer & Co., of Philadelphia, was described in an able paper by A. W. Moyer, and illustrated with stereopticon views. The J. D. Smith Foundry Supply Co., of Cleveland, and the Charles G. Smith Co,, dealer in machine tools, of Pittsburg, were admitted to membership.

PROCEEDINGS OF THE NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

The Iron Age, Jan. 22, 1903. The annual meeting of the New England Foundrymen's Association was held on January 14, at the Hotel Essex, Boston. About 60 members were present. The following officers were re-elected: Henry A. Carpenter, A. Carpenter & Sons Foundry Company, president; B. M. Shaw, Walker-Pratt Mfg. Company, vice president; Fred. F. Stockwell, Barbour-Stockwell Company, Secretary; Geo. H. Lincoln, George H. Lincoln & Company, treasurer. The members of the Executive Committee for 1903, are John Magee, Magee Furnace Company; Theodore Colvin, Colvin Foundry Company; William Doherty, Doherty Bros.; James F. Lanigan, Davis Foundry Company; W. H. Bense, Kinsley Iron & Machine Company.

Important changes were adopted in articles II and III of the constitution. Article II, in regard to the object of the association, now reads: "The objects of this association shall be the advancement of the interests of foundry operators and all others engaged in trades allied to the foundry business; to promote the mechanical and

industrial interests; to collect for the use of the association all proper information connected with the foundry business and its allied interests, and to promote harmony and encourage uniform customs and actions among its members." Article III, as amended, reads: "Any person, firm or corporation engaged in the brass, iron or steel business or allied trades is eligible to membership." These changes are important in that they permit all persons allied to the foundry business to become members of the association.

The following were elected to membership: Rufus K. Jordan, Westbrook, Maine; Becker-Brainard Milling Machine Company, Hyde Park, Mass.; D. F. Egan, Lynn, Mass.; O. G. Thomas, Taunton, Mass., B. F. Sturtevant Company, Jamaica Plain, Mass.

Dinner was served at 6 o'clock, after which William J. Keep, superintendent of the Michigan Stove Works, Detroit, and an eminent authority on foundry practice, addressed the association on Cupola Mixtures, regulating quality by chemical analysis and by mechanical analsis.

At the regular meeting of the New England Foundrymen's Association, held on Feb. 11th, Dr. Richard Moldenke, Secretary of the American Foundrymen's Association, read a paper on the "Valuation of Pig Iron for Foundry Purposes." A long discussion followed the paper. The Association conferred honorary membership upon Dr. Moldenke by rising vote.

The Iron Age, March 19. A meeting of the New England Foundrymen's Association was held at the Hotel Essex, Boston, on Wednesday, March 11. Forty-five members were present. There was a business meeting in the afternoon, at which the following firms were admitted to membership in the association: Coburn Trolley Track Company, Holyoke, Mass.; Alger Foundry Company, West Bridgewater, Mass.; Hugh W. Adams, Boston; Rogers, Brown & Co., Boston; Matthew Addy & Co., Philadelphia. There was an informal discussion in regard to the future plans of the association. Dinner was served at six o'clock.

The speaker for the evening was R. P. Cunningham, superintendent of the Dean Steam Pump Company, Holyoke, Mass., and a member of the association, who spoke on "Melting Steel with Cast Iron." At the close of the address a rising vote of thanks was

given Mr. Cunningham, and W. R. Billings, F. F. Stockwell, F. W. Stickle, J. Magee and others discussed the subject interestingly with the speaker. Not by any means the least among the many good things that were brought out during the evening was a humorous story told by Mr. Cunningham in regard to his experience with test bars on Government work.

Journal of the American Foundrymen's Association.

VOL. XI. APRIL, 1903. PART II.

PROCEEDINGS OF THE METALLURGICAL SECTION.

HERBERT E. FIELD, SECT'Y.

STANDARD METHODS FOR ANALYZING IRON.

INTRODUCTION.

As early as 1899 the American Foundrymen's Association instructed its Standardizing Committee to take steps looking towards the adoption of standard methods for determining the constituents of cast iron. The complaint from furnace-man and founder that the results of different chemists did not agree had become so pronounced that the Association determined to remedy this trouble if possible. It is a well-known fact that very few chemists use exactly the same methods in analyzing iron. This great variation in methods used made possible a source of error which could be overcome by the adoption of standard methods. This question has been prominently before iron chemists for some time, and American, German and Swedish committees have already taken up the methods for the determination of carbon in iron. The American Committee has made their decision in favor of the so-called Copper and Potassium Chloride Method. The fact that this method has been generally adopted by American chemists would indicate that a complete list of standard methods would have a similar reception.

The adoption of standard samples by the American Foundrymen's Association has been a great help towards more accurate commercial work in chemical laboratories. The improvement in methods of sampling pig iron now before this Association for consideration is another step towards the same end. With purer chemicals and standard methods for analysis, the bugbear of inac-

curate chemical work will be abolished. The error, if there be any, will have to be placed on the operator.

This would be an ideal condition in which all foundry and furnace laboratories used the same method of sampling, the same standards for guides, and standard methods for their analysis work. The most ardent supprters of the scheme for standard methods can only hope to approach this ideal. The varying conditions under which different chemists work render impracticable the adoption of rigid standard methods. The work of the Association, to be of permanent value must be sufficiently flexible to conform itself to all conditions of iron analysis. The furnace laboratory, the commercial laboratory with several chemists and the small foundry laboratory with its single chemist present three different phases of the question which must be considered. In many furnace laboratories the casts of one day must be analyzed and ready for piling or shipping the next morning. This makes absolutely necessary the use of methods which give rapid results. The malleable foundry's product may require to be analyzed for silicon while the bath is still molten. The large commercial laboratories must use methods which give prompt results, thus making way for new work.

In contrast with these are the increasing number of small laboratories in separate foundries, each with its single chemist. The aim of the latter is to accomplish the greatest possible amount of work within a specified time, rather than to finish one determination in the shortest possible time. In the former case methods are indispensable which give immediate resulte regardless of the amount of labor required during that time. In the latter case methods which require the least amount of actual time of the chemist are the best suited.

In order to find out just what methods were in use in the different iron laboratories, Mr. West, chairman of the Standardizing Committee, sent requests to many chemists asking them to furnish him a description of the methods used in their laboratories. A considerable number of replies were received to these requests, which, in course of time, were referred to the Secretary of the Metallurgical Section for editing. The number of replies received was not as large as was desired, and an effort will be made to obtain a more representative collection.

The methods sent in are being classified and edited and will be

published in the "Journal" as fast as this work is completed. These classified results will be sent out to chemists all over the country with a request that any methods or operations not included in the report, be sent to the committee. When a sufficiently representative collection is secured, the matter will be referred to a committee for the purpose of selecting the most suitable for use as standard methods It would be impracticable to publish in detail each and every method sent to the committee. They will be outlined in one general scheme and all methods, or modifications of methods, will be included in this outline.

Journal of the American Foundrymen's Association.

VOL. XI. APRIL, 1903. PART II.

PROCEEDINGS OF THE METALLURGICAL SECTION.

HERBERT E. FIELD, SECRETATY.

STANDARD METHODS FOR ANALYSING IRON.

SILICON.

All methods for the determination of silicon in iron in common use depend upon the separation of the silicon from the iron by dissolving the latter in an acid or a combination of acids which will rapidly take it up and leave the silicon in an insoluble condition. All acids dissolve silicon under certain circumstances. If a sample of pig iron is dissolved separately in nitric, sulphuric and hydrochloric acid, the largest amount passes into solution in the nitric acid, and the least in the hydrochloric acid. It is known, however, that if iron dissolved in acid be evaporated with sulphuric or hydrochloric acid sufficiently to dehydrate the silicon, then the latter becomes practically insoluble.

The different methods now in use depend upon this fact and may be divided into two general classes : Sulphuric Acid Methods; Hydrochloric Acid Methods.

The following outline of the methods now in use is drawn from the methods sent in by various chemists and as quoted by them from current books and journals. As an outline, I have taken two methods given in Blair's Chemical Analysis of Iron, and have inserted as modifications the differences which appear in other methods.

OUTLINE.

FIRST STEP.—Weighing out the sample.

Weigh out 1 gram of sample into beaker or dish which is to be used for the determination.

MODIFICATIONS.

Use for charge 3 grams, 2 grams, .934 grams, .940 grams, .4702 grams, .466 grams. (The decimal weights are factor weights

or twice factor weights and are used to simplify the figuring out of per cent. of silicon at the end of the determination.)

SECOND STEP.—Solution of the sample.

(*The kind and strength of acids used are a prominent factor in the accuracy and speed of the determination. The two methods divide at this point and for four steps will be outlined separately.*)

1. SULPHURIC ACID METHODS.

(By far the larger number of chemists use some modification of this method for the determination of silicon in iron. The great variety in the strength and amount of acids used will be noted. This point is one which will readily lend itself to standardization. If the small amount of acids used per gram by some chemists is sufficient, the waste of time and acids by others is quite remarkable.)

A. Dissolve the sample in 20 c. c. nitric acid, 1.20 specific gravity and, when the action has ceased add 20 c. c. of sulphuric acid (1 of acid to 1 of water.)

MODIFICATIONS.

Use 30 c. c. nitric acid 1.20 sp. gr., add 15 c. c. sulphuric acid (1 - 3). Use 20 c. c. nitric acid, 1.20 sp. gr., then add 10 c. c. sulphuric acid (1 - 3).

B. Dissolve the sample in 16 c. c. dilute sulphuric acid, and when action has ceased add 8 c. c. nitric acid, 1.20 sp. gr.

(*In the above and in succeeding cases where other than one gram was used for a charge, I have, for uniformity, proportioned the amount of acid used to a one gram charge.*)

C. Dissolve the sample in a mixture of sulphuric acid, nitric acid, and water.

a– Add sufficient amount of mixture, 1 of sulphuric, 1 of nitric, 2½ of water.

b– Add 20 c. c. per gram of mixture, 1 of sulphuric, 1½ of nitric, 3 of water.

c– Add sufficient amount of mixture, 1 of sulphuric, 1¾ of nitric, 3.2 of water.

d– Add 40 c. c. per gram of mixture, 1 of sulphuric, 2 of nitric and 5 of water.

e– Add 30 c. c. per gram of mixture, 1 of sulphuric, 2½ of nitric, 3 of water.

MODIFICATIONS.

Use 20 c. c. per gram of same mixture.

f- Add 30 c. c. per gram of mixture, 1 of sulphuric, 2.6 of nitric, 5.8 of water.

g- Add 50 c. c. per gram of mixture, 1 of sulphuric, 3 of nitric and 6 of water.

h- Add 30 c. c. per gram of mixture, 1 of sulphuric, 3¼ of nitric, 10 of water.

MODIFICATIONS.

Add 20 c. c. per gram. Add 60 c. c. per gram.

i- Add 35 c. c. per gram of mixture, 1 of sulphuric, 4 of nitric, 12½ of water.

D. Dissolve sample in mixture of sulphuric acid and aqua regia.

a- Add 30 c. c. per gram of mixture, 1 of hydrochloric, 3 of sulphuric, 6 of nitric, and 12 of water.

b- Add 30 c. c. per gram of mixture, 1 of hydrochloric, 5 of sulphuric, 5 of nitric and 10 of water.

E. Dissolve the sample in mixture of sulphuric acid and water.

a- Add 70 c. c. per gram of mixture, 1 of sulphuric, 2½ of water.

b- Add 15 c. c. per gram of mixture, 1 of sulphuric, 3 of water.

c- Add 20 c. c. per gram of mixture, 1 of sulphuric, 6 of water.

d- Add 20 c. c. of mixture, 1 of sulphuric acid and 8 parts of water.

e- Add 30 c. c. per gram of mixture, 2½ sulphuric acid, 1 of water.

f- Add 50 c. c. of water, then 20 c. c. sulphuric acid, 1.84 sp. gr.

THIRD STEP.—Evaporation of the solution, and dehydration of silica.

Evaporate the solution of the drillings on a hot plate until copious fumes of sulphuric acid are given off.

MODIFICATIONS.

Evaporate over free flame to copious fumes of sulphuric acid.

Evaporate over free flame with inverted watch glass until residue

spatters on the glass and sulphuric acid fumes are given off.

Use strap around dish, and prevent spurting by giving dish a circular motion.

Evaporate a few minutes after fumes begin to come off as the more complete the dehydration the more readily will the silicon filter.

Cool with blast of air.

(*It is at this point that the difference in the speed of the determination is most noticeable. It is probable that the greatest error of the method is due to a too short heating after the fumes of sulphuric acid begin to come off.*)

FOURTH STEP.—Solution of the ferrous sulphate.

Dilute with water and boil until all the sulphate of iron is dissolved.

MODIFICATIONS.

Saturate first with strong hydrochloric acid and boil, after adding 25 c. c. of water.

Add 5 c. c. of concentrated hydrochloric acid, add water and boil.

Add a few c. c. of dilute hydrochloric acid, add hot water and boil.

Add 60 c. c. of hydrochloric acid, 1 - 5, and boil.

Add 30 c.c. of water, 30 c. c. dilute hydrochloric acid and boil.

Add 20 c.c. hydrochloric acid 1 - 1 digest for five minutes at 50° C., add 30 c. c. of water and bring to boiling.

Add 10 to 15 c. c. concentrated hydrochloric acid, re-evaporat to dryness, take up with 10 c. c. hydrochloric acid, add water and boil.

Add 15 c.c. chromic acid solution, (120 gr. to liter) boil until chromic acid begins to crystalize out, add water and boil.

(*The great differences in these steps should be noted. If the silica has any tendency to dissolve in hydrochloric acid, it would appear that the regular method of Blair, in which he dissolves the sulphate in water and then washes the silica on the filter with dilute hydrochloric acid, would give more accurate results than these methods which treat the silica immediately with concentrated hydrochloric acid.*)

FIFTH STEP.—Filtering off the silica.

Filter on an ashless filter.

MODIFICATIONS.

Fit an ashless filter paper closely to a funnel, then pierce the point with a glass needle and place plug of best absorbent cotton in the filter and fit it closely to the latter. Wash the filter with distilled water and filter the solution.

MODIFICATIONS.

Use a platinum cone (perforated) with suction for rapid filtration. The filter paper must be strong and fine.

(*The rapid methods of filteration hasten the process. Suitable platinum cones are expensive but if the pierced filter using cotton were accurate, it would be a great saver of time.*)

SIXTH STEP.—Washing the silica.

Wash with hot hydrochloric acid 1 - 1 until free from iron, then with hot water until the residue is free from acid.

MODIFICATIONS.

Same as above, using hot dilute acid and cold water alternately until free from iron.

Wash with hot hydrochloric acid 1 - 3 until free from iron, then with hot water until free from water.

Wash with 5 per cent. nitric acid, and then with water.

(*The washing of the silica is an important step in the determination. An extra moment spent here may save a half hour at the end of the determination.*)

SEVENTH STEP.—Burning off of the filter paper and graphite.

Burn wet in a weighed platinum crucible.

MODIFICATIONS.

Absorb the moisture from the filter paper with blotting paper before burning in the crucible.

Burn in platinum crucible, using oxygen and blast lamp.

Burn with blast lamp and uncovered crucible, after charring the filter paper.

Burn in platinum or porcelain crucible in muffle.

EIGHTH STEP.—Weighing of the silicon dioxide.

Weigh the crucible before and after burning off; difference gives the weight of silicon dioxide.

MODIFICATIONS.

Brush the contents of the crucible into balance pan and weigh directly.

Weigh crucible containing silicon dioxide. Brush out the silica, and weigh the empty crucible. Difference gives weight of silicon dioxide.

NINTH STEP. Checking the Silicon dioxide.

Treat the silicon dioxide in a platinum crucible with a few drops of sulphuric acid. Fill the crucible with hydrofluoric acid, evaporate to dryness, and heat over the blast flame and weigh. The loss in weight is the silicon dioxide.

MODIFICATIONS.

Add to the silicon in the crucible 5 times its weight of sodium carbonate, fuse, treat with an excess of strong sulphuric acid, heat until fumes of sulphuric anhydride come off. Cool, dissolve in water, filter, wash well, ignite and weigh as pure silicon dioxide.

Fuse the silicon dioxide with acid potassium sulphate. Heat until fumes arise, cool, treat with dilute hydrochloric acid, filter off the purified silicon dioxide, wash, ignite, and weigh, etc.

2. HYDROCHLORIC ACID METHOD.

(Quite a large number of chemists prefer this method to the sulphuric acid method. This is chiefly due to the fact that if the sulphuric acid is not sufficiently evaporated, the silica may not be all dehydrated, while when hydrochloric acid is used, it is very easy to note when the solution is sufficiently evaporated to dehydrate the silica.

SECOND STEP.—Solution of the sample.

a– Add to the drillings in beaker or evaporating dish, 20 c. c. of nitric acid, 1 - 20 sp. gr. When the solution is complete, evaporate to dryness in an air bath and then raise the temperature sufficiently to decompose the nitrate of iron.

MODIFICATIONS.

Evaporate in a porcelain evaporating dish over free flame and heat until nitrate is decomposed.

b– Dissolve the drillings in 10 c. c. strong hydrochloric acid, evaporate to dryness and to dehydration of the silica.

MODIFICATIONS.

Dissolve drillings in 40 c. c. concentrated hydrochloric acid. Evaporate to the dehydration of the silica.

Dissolve drillings in a sufficient quantity of hydrochloric acid 2 to 1, etc.

Dissolve drillings in 30 c. c. hydrochloric acid 1 - 3 etc.

THIRD STEP.—Solution of the nitrate and chloride.

Redissolve in 6 c. c. strong hpdrochloric acid. Dilute with water and boil.

MODIFICATIONS.

Saturate with strong hydrochloric acid, add 20 c. c. of water and boil.

Add 10 c. c. of concentrated hydrochloric acid, add water and boil.

Add 30 c. c. hydrochloric acid, 1 - 3, and boil.

The fourth and remaining steps are identical with the steps in the Sulphuric Acid Method.